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INTRODUCTION

Chapter 8 Introduction

This chapter covers pool and spa requirements for all multifamily buildings for newly constructed buildings and additions or alterations to existing buildings.

Guidance on general requirements is included in the Multifamily Compliance Manual Chapter 1: General Requirements. Guidance on administrative requirements is included in the Multifamily Compliance Manual Chapter 2: Compliance and Enforcement. This chapter includes guidance on pool and spa requirements.

Table 8-1: Excerpt from Table 100.0-A Application of Standards provides an overview of the location of the pool and spa requirements that apply to multifamily occupancies in the Energy Code.

Table 8-1: Excerpt from Table 100.0-A Application of Standards

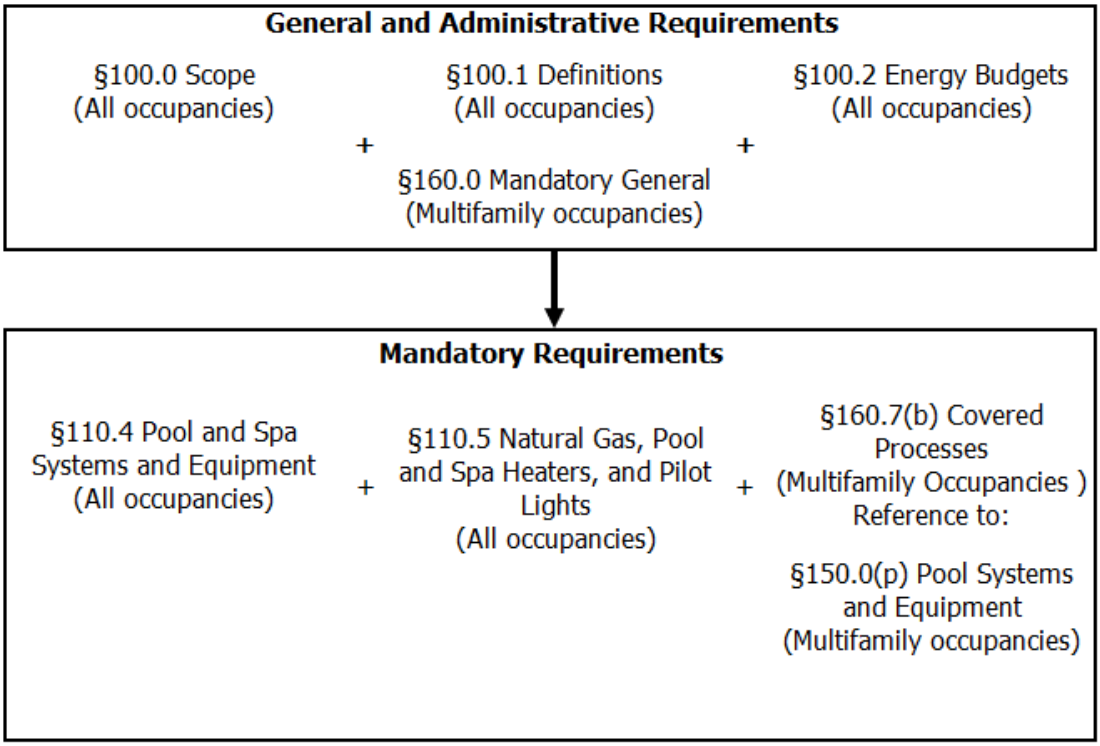
Application	Mandatory	Prescriptive	Performance	Additions/ Alterations
General[1]	160.0	N/A	N/A	180.0
Pool and Spa Systems	110.4, 110.5, 160.7(b), 150.0(p)	N/A	N/A	See Mandatory Requirements

1. Guidance on General Requirements from Sections 160.0 and 180.0 are included in the Multifamily Compliance Manual Chapter 1 General Requirements. Guidance specific to multifamily pools and spas is included in this chapter.

Source: California Energy Commission

Figure 8-1: Flowchart Guidance for Application of New Construction Multifamily Pool and Spa Requirements and Figure 8-2: Flowchart Guidance for Application of Addition or Alteration Multifamily Pool and Spa Requirements below illustrate the applicable sections for newly constructed buildings and additions or alterations to existing buildings.

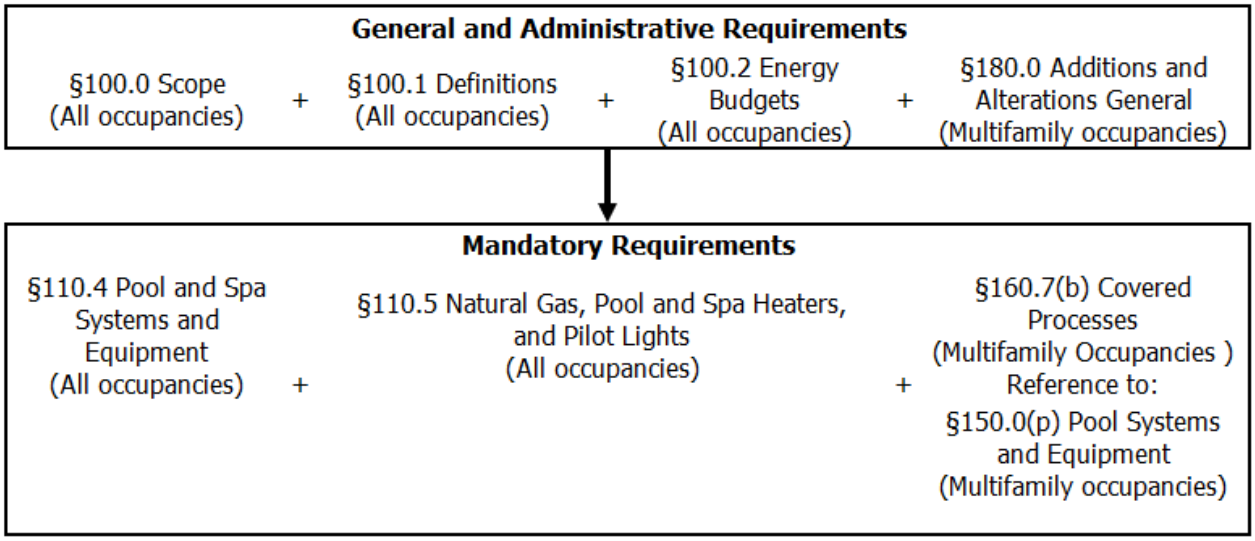
Figure 8-1: Flowchart Guidance for Application of New Construction Multifamily Pool and Spa Requirements



Newly Constructed Buildings Compliance Approaches

Source: California Energy Commission

Figure 8-2: Flowchart Guidance for Application of Addition or Alteration Multifamily Pool and Spa Requirements



Addition, Alteration Compliance Approaches

Source: California Energy Commission

SECTION 110.4 – MANDATORY REQUIREMENTS FOR POOL AND SPA SYSTEMS AND EQUIPMENT

(a) Certification by manufacturers. Any pool heater for a pool, spa, or a pool and spa combination shall be installed only if the manufacturer has certified that the system or equipment has all of the following:

1. **Efficiency.** Equipment subject to State or federal appliance efficiency standards shall comply with the applicable provisions of Section 110.1; and
2. **On-off switch.** A readily accessible on-off switch, mounted on the outside of the heater that allows shutting off the heater without adjusting the thermostat setting; and
3. **Instructions.** A permanent, easily readable and weatherproof plate or card that provides the energy efficiency rating and instruction for the energy efficient operation of the pool and/or spa heater; and

«» Commentary for Section 110.4(a):

The pool heater is subject to minimum efficiency requirements, much like other mechanical equipment under minimum state or federal appliance efficiency standards. This is so that the equipment manufacturers be held to the same standard for products sold to consumers. The equipment must have an on-off switch to allow the user to shut off heating completely when no heating is desired. An example would be when the user decides to close the pool for winter. The equipment must also have instructions to inform the user of the energy efficiency rating and methods for energy efficient use of the pool heater. «»

(b) Installation. Any pool and/or spa system or equipment shall meet the following requirements:

1. **Heating Equipment.** Equipment installed to heat water for pools and/or spas shall be selected from equipment meeting the standards shown in Table 110.4-A.

Table 110.4-A HEATING EQUIPMENT STANDARDS

Heating Energy Source	Standard
Electric Resistance	UL 1261
Gas-fired	ANSI Z21.56/CSA 4.7a
Heat Pump	AHRI 1160 and one of the following: CSA C22.2 No. 236, UL 1995, or UL/CSA 60335-2-40
Solar	ICC/APSP 902/SRCC 400 for solar pool heaters, ICC 901/SRCC 100 for solar collectors

«» Commentary for Section 110.4(b)1:

The pool heater shall meet the standards shown in the table to ensure that the equipment chosen to heat the pool is a pool heater rather than another type of water heater that would not be suitable for pool water heating. **«»**

2. **Piping.** At least 18 inches of horizontal or vertical pipe shall be installed between the filter and the heater or dedicated suction and return lines, or built-in or built-up connections shall be installed to allow for the future addition of solar heating equipment;

«» Commentary for Section 110.4(b)2:

If a pool or spa does not currently use solar heating collectors for heating of the water, piping must be installed to accommodate any future installation. Contractors can choose one of three options to allow for the future addition of solar heating equipment.

1. Leave at least 18 inches of horizontal or vertical pipe between the filter and heater to allow for the future addition of solar heating equipment
2. Plumb separate suction and return lines to the pool dedicated to future solar heating
3. Install built-up or built-in connections for future piping to solar water heating, (example: a built-in connection could be a capped off tee fitting between the filter and heater) **«»**

3. **Covers.** Outdoor pools and/or spa with electric or gas heating equipment shall be installed with a pool cover.

«» Commentary for Section 110.4(b)3:

The pool cover must be fitted and installed during the final inspection. The cover requirement is limited to pools that are heated by a heater that uses gas or electric. Pools that are not heated or are only heated by solar do not have a pool cover requirement. «»

4. **Directional inlets and time switches for pools.** If the system or equipment is for a pool:

   i. The pool shall have directional inlets that adequately mix the pool water; and

   ii. A time switch or similar control mechanism shall be permanently installed as part of a pool water circulation control system that will allow all pumps to be set or programmed to run only during off-peak electric demand period, and for the minimum time necessary to maintain the water in the condition required by applicable public health standards.

«» Commentary for Section 110.4(b)4:

Pool controls are a critical element of energy efficient pool design. Modern pool controls allow for auxiliary loads such as cleaning systems, solar heating, and temporary water features without compromising energy savings. «»

(c) Heating Source Sizing. Heating systems or equipment for pool and/or spa shall meet one of the sizing requirements 1 through 5 below:

1. A solar pool heating system with a solar collector surface area that is equivalent to the following:
   A. For nonresidential and multifamily buildings, 65 percent or greater of the pool and/or spa surface area.
   B. For single family buildings, 60 percent or greater of the pool and/or spa surface area.
2. A heat pump pool heater as the primary heating system that meets the sizing requirements of Reference Joint Appendix JA16.3. The supplementary heater can be of any energy source; or
3. A heating system that derives at least 60 percent of the annual heating energy from on-site renewable energy or on-site recovered energy.
4. A combination of a solar pool heating system and heat pump pool heater without any additional supplementary heater; or
5. A pool heating system determined by the Executive Director to use no more energy than the systems specified in Items 1, 2, 3, or 4 above.

Exception 1 to Section 110.4(c): Portable electric spas compliant with 20 CCR § 1605.3(g)(7) of the Appliance Efficiency Regulations.

Exception 2 to Section 110.4(c): Alterations to existing pools and/or spas with existing heating systems or equipment.

Exception 3 to Section 110.4(c): A pool and/or spa that is heated solely by a solar pool heating system without any backup heater.

Exception 4 to Section 110.4(c): Heating systems which are used exclusively for permanent spa applications in existing buildings with gas availability.

Exception 5 to Section 110.4(c): Heating systems which are used exclusively for permanent spa applications where there is inadequate Solar Access Roof Area (SARA) as specified in Section 150.1(c)14 for a solar pool heating system to be installed.

«» Commentary for Section 110.4(c):

The pool heater shall be chosen from among the five options unless one of the five exceptions apply, in which case no requirement exists. Each of the first four options requires a primary heating system other than a gas pool water heater. The fifth option must be shown to use no more energy as determined by the CEC Executive Director through a CEC process. A supplementary gas pool water heater may be used to meet load when conditions or heating load do not allow the primary heating system to maintain the desired pool temperature. The exceptions allow for deviation from the primary heating system requirements when circumstances do not allow for a feasible or cost-effective use of the options. «»

(d) Controls for Heat Pump Pool Heaters with Supplementary Heating. Heat pump pool heaters with supplementary heaters shall have controls that meet the following:

1. Supplementary heater shall not operate when the heating load can be met by the heat pump pool heater alone; and
2. The cut-on temperature for heat pump heating is higher than the cut-on temperature for supplementary heating, and the cut-off temperature for heat pump heating is higher than the cut-off temperature for supplementary heating.

«» Commentary for Section 110.4(d):

The heat pump pool heater should be able to carry the pool heating load in most mild coastal climates. In climates where heating is desired in colder winter months, the controls should sense when conditions allow for use of only the heat pump pool heater to maintain energy savings versus using a backup electric resistance or gas pool water heater. «»

SECTION 110.5 – NATURAL GAS CENTRAL FURNACES, COOKING EQUIPMENT, POOL AND SPA HEATERS, AND FIREPLACES: PILOT LIGHTS PROHIBITED

Any natural gas system or equipment listed below may be installed only if it does not have a continuously burning pilot light:

(a) Fan-type central furnaces.

(b) Household cooking appliances.

Exception to Section 110.5(b): Household cooking appliances without an electrical supply voltage connection and in which each pilot consumes less than 150 Btu/hr.

(c) Pool heaters.

(d) Spa heaters.

(e) Indoor and outdoor fireplaces.

Note**:** Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.8, and 25943, Public Resources Code.

«» Commentary for Section 110.5:

Pool and spa heaters shall not have a continuously burning pilot light. A continuously burning pilot light uses gas while not providing useful heating for the pool or spa. «»

SECTION 160.7 – MANDATORY REQUIREMENTS FOR COVERED PROCESSES

(b) Pool and spa systems. Pool and spa systems available to multiple tenants or to the public shall comply with the applicable requirements of Section 110.4. Pool and spa systems installed for exclusive use by a single tenant shall comply with the applicable requirements of Section 150.0(p). Pool and spa systems installed for public use shall comply with Section 150.0(p)2, Section 150.0(p)3, and Section 150.0(p)4.

«» Commentary for Section 160.7(b):

Pool and spa systems available to multiple tenants or to the public must comply with the applicable requirements of Section 110.4, detailed above. Pool and spa systems available to the public must also comply with Section 150.0(p)2, Section 150.0(p)3, and Section 150.0(p)4.

Pool and spa systems installed for exclusive use by a single tenant shall comply with the applicable requirements of Section 150.0(p). «»

NOTE: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8 and 25943, Public Resources Code.

SECTION 150.0 – MANDATORY FEATURES AND DEVICES

Single-family residential buildings shall comply with the applicable requirements of Sections 150(a) through 150.0(v).

NOTE: The requirements of Sections 150.0(a) through 150.0(v) apply to newly constructed buildings. Sections 150.2(a) and 150.2(b) specify which requirements of Sections 150.0(a) through 150.0(v) also apply to additions or alterations.

(p) Pool systems and equipment installation. Pool system or equipment shall comply with the applicable requirements of Section 110.4, as well as the requirements listed in this section.

«» Commentary for Section 150.0(p):

As noted in Section 160.7, above, pools in multifamily buildings must comply with all applicable requirements in Section 150.0(p), as outlined below. «»

A. Dedicated-purpose pool pumps and replacement dedicated-purpose pump motors subject to State or federal appliance standards shall be listed in the Commission's directory of certified equipment. Dedicated-purpose pool pumps shall meet the applicable standards set forth in 20 CCR § 1605.1(g)(7) of the Appliance Efficiency Regulations. Replacement dedicated-purpose pool pump motors shall meet the applicable standards set forth in 20 CCR § 1605.3 of the Appliance Efficiency Regulations;

B. All pump flow rates shall be calculated using the following system equation:

$H = C \times F^2$

where:

H – is the total system head in feet of water.

F – is the flow rate in gallons per minute (gpm).

C – is a coefficient based on the volume of the pool:

0.0167 for pools less than or equal to 17,000 gallons.

0.0082 for pools greater than 17,000 gallons.

C. Filtration pumps shall be sized, or if programmable shall be programmed, so that the filtration flow rate is not greater than the rate needed to turn over the pool water volume in 6 hours or 36 gpm, whichever is greater; and

«» Commentary for Section 150.0(p)1C:

All pool pumps sold in California must be tested and listed with the Energy Commission according to the *Appliance Efficiency Regulations*. The pool pump must be chosen such that the flow rate calculated by the system curve is less than the 6-hour turnover rate or 36 gpm, whichever is greater. The following equation is used to calculate the system curve. The coefficient included in the equation is dependent on the capacity of the pool.

$$H = C \times F \times 2$$

Where,

1. H = The total system head in feet of water
2. F = The flow rate in gallons per minute (gpm)
3. C =0.0167 for pools less than or equal to 17,000 gallons, or 0.0082 for pools greater than 17,000 gallons «»

D. Dedicated-purpose pool pumps with more than one speed shall have controls which default to the filtration flow rate when no auxiliary pool loads are operating; and

«» Commentary for Section 150.0(p)1D:

For maximum energy efficiency, pool filtration should be operated at the lowest possible flow rate for a period that provides sufficient water turnover for clarity and sanitation. Auxiliary pool loads that require high flow rates, such as spas, pool cleaners, and water features, should be operated separately from the filtration to allow the filtration flow rate to be kept to a minimum.

Pool controls are a critical element of energy efficient pool design. Modern pool controls allow for auxiliary loads such as cleaning systems, solar heating, and temporary water features without compromising energy savings. «»

E. For dedicated-purpose pool pumps with more than one speed, the controls shall default to the filtration flow rate setting within 24 hours and shall have an override capability for servicing.

2. **System piping.**

A. A length of straight pipe that is greater than or equal to at least 4 pipe diameters shall be installed before the pump; and

B. Pool piping shall be sized so that the velocity of the water at maximum flow for auxiliary pool loads does not exceed 8 feet per second in the return line and 6 feet per second in the suction line; and

C. All elbows shall be sweep elbows or of an elbow-type that has a pressure drop of less than the pressure drop of straight pipe with a length of 30 pipe diameters.

«» Commentary for Section 150.0(p)2

Correct sizing of piping, filters, and valves reduces overall system head, reduces noise and wear, and increases energy efficiency. Other mandatory requirements include leading straight pipe into the pump, directional inlets for mixing, and piping to allow for future solar thermal heating installations.

There must be a length of straight pipe that is greater than or equal to at least 4 times the pipe diameters installed before the pump. That is, for a 2-inch suction pump, there must be at least 8 inches of straight pipe before the pump.

Pool piping must be sized according to the maximum flow rate needed for all auxiliary loads. The maximum velocity allowed is 8 feet per second (fps) in the return line and 6 fps in the suction line. Table 8-2: Hour Turnover Pipe Sizing shows the minimum pipe sizes required by pool volume based on a 6-hour turnover filtration flow rate. These pipe sizes would need to be increased if there are auxiliary loads that operate at greater than the filtration flow rate. Conversely, they could be reduced if the pump is sized for greater than a 6-hour turnover filtration flow rate.

Table 8-2: Hour Turnover Pipe Sizing

Pool Volume, min (gallons)	Pool Volume, max (gallons)	Minimum Pipe Diameter (in), return	Minimum Pipe Diameter (in), suction
-	13,000	1.5	1.5
13,000	17,000	1.5	2.0
17,000	21,000	2.0	2.0
21,000	30,000	2.0	2.5
30,000	42,000	2.5	3.0
42,000	48,000	3.0	3.0
48,000	65,000	3.0	3.5

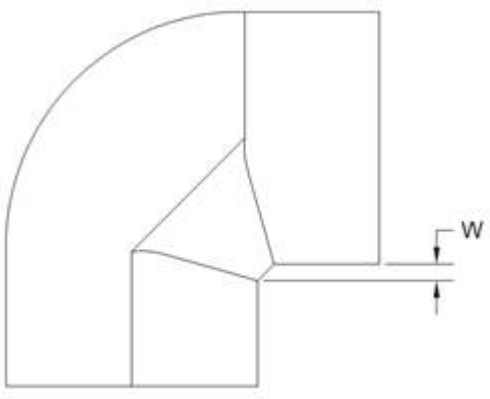
Source: California Energy Commission

Traditional hard 90° elbows are not allowed. All elbows must be sweep elbows or a type of elbow that has a pressure drop less than the pressure drop of straight pipe with a length of 30 times the pipe diameters. For example, a 2-inch elbow must have a pressure drop less than a 5-foot length of a 2-inch straight pipe.

Field verification of sweep elbows may be performed by checking that the distance "w" of the installed sweep elbow is greater than that for a hard 90 elbow. (See Figure 8-3: Measuring "W" at the Pool Site.) The difference in measurement between the radial edge of one sleeve to the perpendicular side of the elbow is found to be distinct between sweep elbows and hard 90s. There is sufficient difference in distance "w" such that all sweep elbows exceed the minimum values listed in Table 8-3: Pool Site Measurement for Sweep Elbows.

Figure 8-3: Measuring "W" at the Pool Site below illustrates "w" the dimension between the elbow sleeves, and Table 8-3: Pool Site Measurement for Sweep Elbows shows the minimum distances "w" for an acceptable sweep elbow.

Figure 8-3: Measuring "W" at the Pool Site



Source: California Energy Commission

Table 8-3: Pool Site Measurement for Sweep Elbows

Pipe Diameter	Minimum W (inch)
1.5	3/8
2	1/2
2.5	5/8
3	3/4
4	1

Source: California Energy Commission

«»

3. **Filters.** Filters shall be at least the size specified in NSF/ANSI 50 for public pool intended applications.

«» Commentary for Section 150.0(p)3:

Filters shall be sized using NSF/ANSI 50 based on the maximum flow rate through the filter. The filter factors that should be used to determine the proper size are in ft²/gpm.

1. Cartridge: 0.375
2. Sand: 15
3. Diatomaceous Earth: 2

«»

4. **Valves.** Minimum diameter of backwash valves shall be 2 inches or the diameter of the return pipe, whichever is greater.

«» Commentary for Section 150.0(p)4:

Multiport backwash valves have a high-pressure drop and are discouraged. Low-loss slide and multiple three-way valves can provide significant energy savings. **«»**